Space Weather Forecast

Issued on Sunday, 18 December 2022 at 13:26 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Moderate-class X-ray flares likely. Slight chance of Minor Geomagnetic Storms throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been moderate over the past 24 hours, with peak activity being a Moderate-class X-ray flare seen at 17/1953UTC from a sunspot near the northeastern solar horizon. There are currently eight sunspot regions on the Earth-facing side of the Sun, with most magnetically unipolar and stable or relatively simple bipolar regions with no significant changes. More significantly, a large region now no longer visible in the southwest was replaced by new arrivals in the east that are very likely hiding some complexity (due to the narrow viewing angle).
No new Earth-directed Coronal Mass Ejections (CMEs) are confirmed at the time of wiring, although eruptions from near the southwest limb at around 18/0600 UTC and from AR3162 at 18/1010 UTC are currently being analysed.

Solar Wind / Geomagnetic Activity: Solar winds were slow ranging from 270-350 km/s. Both the number of particles and their associated magnetic field were also near the long-term average, with no prolonged alignment or anti-alignment with Earth's field.
The net result of the above solar wind measures was for Quiet geomagnetic activity throughout, well below Minor Geomagnetic Storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is Likely to remain at Moderate levels, particularly at first, with a large sunspot only recently transiting round to the far side. However, a new arrival appears to be capable of similar levels of activity, and far side soundings as well as recent far-sided CMEs suggest that there may be a large region nearing the eastern horizon into the UTC week, perhaps preserving the risk of further Moderate-class flares.

Solar Wind / Geomagnetic Activity: Two CMEs may give slight glancing impacts on days 1 and 2 (18th and 19th), although confidence in this aspect of the forecast is notably low. Otherwise, solar winds are expected to follow a slow regime initially, perhaps becoming slightly elevated later on day 1 (18th) but more likely day 2 (19th), due a coronal hole fast wind. A second fast wind from another coronal hole is then likely to feature on day 4 (21st).
The above combination of low confidence CME activity and two successive fast wind streams should combine to give a daily Slight Chance of Minor geomagnetic storms, with day 3 (20th) looking like the best chance of background conditions.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, however there is slight chance of S1 level storms with the occurrence of any notable flares, especially while a large sunspot crosses the best-connecting western solar horizon (with Earth should a proton-rich X-ray flare event occur).

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	15	5	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	50	50	50
Very Active	R3 to R5 X	No	10	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	15	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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